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FACULTY OF BUSINESS STUDIES
Lebanon Branch

T306. Managing Complexity: a systems approach

Air Pollution in Lebanon

Final Project Presented by
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Tutor's Comments

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Preface

Environmental deterioration has become among the most pressing public and official concerns worldwide, both in developing and developed countries. Numerous programs and studies have been implemented to control the damaging consequences of industrial pollution, deforestation, the disposal of hazardous waste, soil erosion, and other pressing environmental problems. In Lebanon, such environmental problems are especially acute due to the effects of the long war and the lack of adequate environmental policies and services. Air pollution due to many sources has been identified as one of the urgent public health issues facing the country, especially in urban areas.

The following study investigates the economic and health effects of air pollution in Lebanon. Health impacts are expressed in both physical and monetary terms for lives lost to premature death, for hospital admissions, for chronic disease cases, for emergency room admissions, and for days of restricted activity due to hospitalization for various diseases. The study estimates concentration levels for particulates, ozone, carbon monoxide, nitrogen oxides, hydrocarbons and lead. The findings indicate that pollution levels in the city far exceed all international standards. It then links pollution levels to health outcomes through well-established concentration-response relationships. With an estimated average concentration of 200μ g/m^3 for particulates, the potential social and economic impacts of air pollution in Lebanon are rather obvious and alarming. The study concludes with a set of policy recommendations to mitigate such impacts and to support an economically and politically feasible pollution control program.

Chapter I. Introduction

Air pollution is the introduction of chemicals, particular matters, or biological materials that cause harm of discomfort to humans and other living organisms, and damages the natural environment into the atmosphere.

The atmosphere is a complex, dynamic gaseous system that is essential to support life on planet earth. Stratospheric ozone layer depletion due to air pollution has long been recognized as a threat to human health and well to earth climate.

Air pollution has been defined as a serious mess since the 16th century and many suggestions has been stated since then, in order to reduce this dangerous fact but till now no real procedures have been taken into especially in our country Lebanon in order to start solving these problems we are facing because of air pollution and enhance air quality and living standards in our country.

Atmospheric pollution which constitutes for ordinary citizens, the most evident aspect of the problem of the environment had been the least researched in Lebanon, the air of the cities and areas of large human population is poor and the quality of the air decreases with the increase of factories, number of cars, and with the formation enveloping fog around the cities.

In 1973, the national council for scientific researches (NCSR) launched a scheme for the continuous observation of context in the aim of harmful matters (gasses & dust). The war put an end to the project since then the atmospheric pollution problems continue to worsen.

Air pollution has not been the subject of any regulations with the exception of the prohibition of the importation and use of diesel vehicles (law of the 10th June, 1961 & decree 579 of the 1st of August, 1956) and the required conditions for vehicles, which currently are not being totally applied. There exists no authority in Lebanon which is directly responsible for the quality of the air and the protection of the atmosphere against air pollution.

In order to deal with air pollution there are several ideas and implementation to be implemented, first we must consider the environment as a whole and the threats facing it, we should define parties involved and causes, effects for this mess and these issues must be presented to all citizens living in Lebanon so that they will recognize the impact of air pollution and then we will be discussing the solutions and presentation in better words to decrease the effect of this dangerous mess on our health and earth life.

Chapter II. Tutor Report

Session 1. Aims, interests of this complexity V, B, C

"People in Lebanon, must protect the environment and especially our air quality for the benefit of future generations".

Air pollution is a huge mess in Lebanon that is causing damages to people's safety and earth's climate also. I believe that earth and its resources are every persons right and its not owned by anyone and our duty is to protect it for the benefit of other generations after us. Air pollution is causing serious deceases even death to many people and citizens and this is all man made, it should be an interesting subject for all Lebanese to get informed about and what implications must be applied and how to reach better air quality for better living standards. Any person that values peoples right to live in a good health and also values the environment safety has to believe that earth and it resources are not only ours but they are the right of future generations to benefit from especially air that is the major resource of living that is the right of every living being on earth.

Session 2: BECM Balls

A system practitioner is a juggler trying to keep four balls in the air **BECM** balls:

B Being a practitioner with a particular tradition of understanding
E Engaging with the real situation or real world, which means engaging with the real mess and what is causing it, who are the stakeholders involved?
C Contextualizing a particular approach, methods, tools, etc… to know the situation, that means how are we going to put particular approaches into context and action and what implications should be stated and how can we implement them.
M Managing the complexity of the situation that means, after the implementation of suggestions and solutions we should keep following up the process results and reach our stated goals.

1- Being inside our mess in considered with having all the information about air pollution and the history of it and what is the whole situation really about.
2- Engaging with air pollution is about getting engaged with the stakeholders and with the real world and in our case engaging with the real world is a part of our life, because the corruption in our environment can be seen everyday. Also we must state the causes of air pollution in Lebanon, effect and try to suggest so processes and suggestion in order to reach better results.
3- Contextualizing this step considers the suggestions, a deeper view of solutions where we have a clean idea of the problem situation and what are the ways and means for implementing these suggestions and how can they be reached.

4- Managing our implementation and suggestion and following up the issues rising in order to keep a full control of our mess and prevent it from happening again.

Session 3. Soft System Method

The soft system method involves 8 stages:

Stage 1: The problem situation unstructured

Air pollution is a situation problem rather than a specific problem that can easily be solved. It's a situation that covers all sectors in Lebanon and don't exclude anyone, no matter race, gender and social being and it might be the only thing that covers all Lebanese together.
In this case there are many people involved and many stake holders that have different perspectives and duties than each other.

Stakeholders

1- Government: the government in Lebanon is responsible for people's and countries safety it's duties don't only fall under tax collection or formulating rules and regulations but also should take care of the environment.
2- Ministry of environment: it should be the direct authority to take care of the environment and the crisis it's facing.
3- Ministry of health: this ministry should be responsible for people's health and safety and should encourage living in better and healthier environment.
4- Ministry of power supply: should be responsible of the damages it is causing because of CO2 and NO2 emissions for the supply of energy.
5- Ministry of transportation: should be responsible for all traffics and roads and deforestation being done from building of factories and roads.
6- Hospitals: hospitals are also responsible for people's safety and should care for it.
7- Factories: despite the job opportunities they are creating but in the same time they should cut down ruining the environment and try to find better resources that are less toxic on the environment then those they are using in their production and manufacturing.
8- Scientists & Researches: instead of emigration, the government should encourage researchers and scientists and put their hands together for finding solutions for our air pollution.
9- Environment care and non-profit organizations: these organizations are very useful in our society because they play the roll of teachers and try to teach people to go green and save our environment.
10- Media: is one of the important stakeholders that aren't playing the role it should be played in designing advertisements in order to encourage people

save their environment and shows them the impact they are causing to the air they are breathing.

11- Agricultural sector: the ministry of agriculture should be encouraging forestation instead of deforestation and should help farmers avoid using fertilizers and pesticides and teach them how to use it for better results for the environment and health.

12- Citizens: they are the most important stakeholders, they have the right to benefit for the air quality and healthy environment in the country they live in, and they also have duties against the environment that lies under the responsibilities taking care of this air and avoid polluting it.

13- Ministry of tourism: there is now something called Eco-Tourism it's a new plan helps tourists and encourages them save they country they are visiting and enjoying their vacations in, through advertisements and control made by responsible, and through touristic transportation held by a public sector or the government this will help our tourists enjoy their vacations with less costs and it will help us enjoy our profits from these tourists with less impact on air pollution.

Each of the mentioned stakeholder have different responsibilities and rights towards the environment, but they all should work as a linked system in order to reach a healthier environment with better air quality for all parties to benefit from.

Stage 2: Rich Picture, Issues and Primary tasks

The idea of using a rich picture (Appendix 1) is about thinking about issues is common to several problem solving or creative thinking methods, because an initiative consciousness communicates more easily in impressions and symbols rather than words.
In the rich picture we can see an over view on Lebanon's map and the main causes of air pollution, factories, transportation, deforestation, abuse of fertilizers and pesticides and stakeholders involved in a general over view of the whole situation.

Issues:

The first question we should ask ourselves is if we continue this way what problems and surprises will be waiting us?
Air pollution is a very dangerous mess and should be treated seriously and consciously due to the large emissions of CO2 due to cars, factories, deforestation and chemical use, our humanity is facing big problems, the first problem is global warming, this issue is increasing the temperature in the earth crust and leading to volcanic eruption inside the core and this is leading to earthquakes, volcano eruption, tsunamis, raise of sea level, higher temperature than usual, and whether corruption.
The second problem is that we no longer benefit from the fresh air or O2 that keep our lungs working properly and our blood circulation good, due to large percentage

of CO2 emissions and air pollution there are 40% of people dying in Lebanon because of lung cancer and heart attacks, because the fog created on the top of cities its preventing the emissions from reaching the higher atmosphere and create a big cloud over our precious country.
The third problem is the economic loss: the World Bank has estimated the total economic loss of environmental degradation in Lebanon about $500 Million a year, presenting 5% of the gross domestic product (GDP) which exceeds the level of growth.
Finally, our last problem is the tourism loss: Lebanon if continued this way will probably loose this 2 million tourist average yearly, if they didn't form a platform that includes several suggestions to be taken into account and implemented.

Primary tasks:

This part is the most important part where we are going to find many suggestions that will help us save Lebanon from the environmental crisis it is facing.
Few basic steps should precede the implementation of a viable environmental platform in Lebanon should be done

- Organizing and activating the ministry of the environment to enable it to manage efficiently in the areas of environmental policies and strategic planning; laws and legislation; industry and consumer protection; international relations including treaties and organizations; information and awareness.
- Establishing a higher environmental council, presided over by the prime minister, to act as a decision-making body entrusted with setting cross-sector national environmental policies and authorized to take binding decisions.
- Instituting an Environmental Emergency Board grouping the most distinguished professionals and cadres of environmentalists, whose mission would be to conduct, within three months, a comprehensive survey of all the environmental initiatives and program that had acquired international, bilateral or local financing, in order to assess their status and determine the possibilities of benefiting from them to avoid repetition. The Board should also define environmental priorities for 12 months.
- Adopting a national environment policy, for example ISO Air Quality management system ISO 8574:2000 which sets specific goals that allow for accountability and can determine successes and failures within a designated time frame. (Appendix 9)

- **Land use and zoning:**
  - Develop a master plan that defines different land uses, specifying residential, commercial, agricultural, industrial, tourist and forest zones, according to advanced scientific standards that strike a balance between development needs and environmental requirements and define the environmental characteristics of each region. With most of the country

not covered by strict zoning regulations, permits to exploit land have become a lucrative political commodity, with politicians arranging permits as a bribe to mollify their constituents.

- Put all illegally-acquired private coastal properties into the public domain within a designated time frame; oblige owners to open their facilities immediately to the public during a transition period; and demolish illegal structures that deface the coast within 24 months. Accepting the status quo created by some investors who misappropriated beaches for private use under shady arrangements-thus barring access by the public, including tourists, to a major natural commodity in Lebanon-shouldn't be allowed to continue.

- **Air:**
  - Establish stations to monitor the quality of air, especially in areas that are highly exposed to industrial or traffic pollution.
  - Set modern standards to determine permitted levels of emissions from cars and industries, and impose implementation through supervision, inspection and fines.
  - Apply a modern system for the periodic inspection of cars, through a network of designated licensed private workshops, whose personnel could be trained to apply the required standards. This measure would provide job opportunities for a large number of technicians and, at the same time, reduce air pollution and guarantee the safety of passengers and commuters.
  - Modernize public transport and encourage its use. One way would be to replace the cash transportation allowance applicable now by a monthly bus pass provided by the employer. Rail and ferry connections should be seriously considered to facilitate transportation between coastal locations, and thus ease the heavy traffic that is concentrated specifically along the coastal highways.

- **Energy:**
  - Earmark a budget for scientific research on renewable energy and produce a wind and sun atlas, as part of a feasibility study that would designate the regions in Lebanon where those technologies could be efficiently applied.
  - Control energy consumption in private and public places and launch a program for energy conservation. This could include subsidies for things such as isolating walls, windows and roofs; using construction materials that are energy efficient; and developing standards for building materials and energy conservation methods.
  - Promote the use of solar energy to heat water in private and public places and support local solar industries in this regard, with the goal of converting 50 per cent of houses to solar water heating within 10 years. This would entail appropriate fiscal measures and tax incentives

- Establish pilot projects to generate solar and wind energy, along with biogas, especially in farming areas.

- **Agriculture and forests:**
  - Set environmentally-friendly standards for the use of pesticides, fertilisers and hormones.
  - Encourage organic farming and train farmers to use natural methods; support the marketing of organic farming produce through specialized co-operatives.
  - Establish rural industries for drying and preserving fruit and other crops, using appropriate methods such as solar energy.
  - Reclaim sites of old stone quarries by transforming them into agricultural terraces, complimented by a forestation program, at the expense of the parties that had illegally exploited them; conduct a feasibility study on importing rocks and stones from neighboring countries to help preserve the stressed Lebanese landscape.
  - Launch a national reforestation program to cover 100,000 hectares with trees over a period of 10 years.
  - Develop an integrated forest management plan, including fire protection, in association with local authorities and the civil society.

- **Waste Management:**
  - Set a national waste management plan that adopts an integrated approach and defines appropriate solutions for each region
  - Decrease the quantity of waste at source and promote reusing and recycling, through practical systems and appropriate tax measures. The aim should be to decrease domestic waste by 30 per cent and recycle 20 per cent of it in five years.
  - Guarantee proper conditions for a healthy and safe working environment, protecting workers from chemical, noise, radiation and other forms of pollution.
    Set working environment standards for different types of professions.
  - Set emission and discharge levels allowed for various industries and activities.
  - Encourage industries and businesses to apply for ISO certificates

- **Education and information:**
  - Reinforce environmental programs in schools and endorse intensive training sessions for teachers on environmental themes and activities; promote environmental school clubs.
  - Establish museums, natural history and environmental science centres, where children and the general public can learn about nature and the environment.
  - Designate TV and radio time for environmental education.

- Launch an environmental information plan that aims at changing individual attitudes and behaviour towards specific issues affecting the environment, as personal action is a crucial step towards a better environment.

All these basic steps will help people recognize the efforts from those in responsibilities and encourage and teach them about the causes of air pollution and how to prevent it leading to better air quality in our environment and better indoor air quality.

Stage 3: Relevant systems and its root definition + CATWOE

Air pollution is not just a mess that is affecting Lebanon's environment it's also affecting people's safety, earth climate and weather, and this is all affecting our health and people safety leading sometimes to death due to lung deceases and such as cancer, heart attacks, stress and other serious deceases.
So there are several systems relevant to air pollution:

- System 1: people's safety and right to live in a healthy environment.
- System 2: environmental crisis and effects from this crisis on earth.
- System 3: Global warming and its affects.
- System 4: Affect of air pollution or tourism.
- System 5: Economical reflection and loses.
- System 6: Sustainable development and effect on the environment.

System 1: Air pollution is affecting people's safety and the right of living in a healthy environment as stated before due to CO2 and SO2 emissions to the air, the major pollutants of the atmosphere are the cement works, refineries, thermo-electric power houses, a multiplicity of small combustion sources and generators installed at numerous industrial premises and residences to compensate for power cuts.
Production of electric energy pollute the atmosphere by the discharge of thermo-electric power plants, the sulphur content of fuel used in Lebanon is high and so are SO2 and CO2 emissions, so are the combustion fuel from cars, trucks, busses, airplanes and other means of transportation, they are all leading for air and environmental pollution.

In order to check our work CATWOE checklist should be applied:

- **C** customers or beneficiaries that are citizens in our case that are suffering from pollution and its effects on our health and lives
- **A** Actors are those who carry our the activities which are the government and its ministries that should set up plans for the help to decrease the effect of development, service, power supply and transportation and other things on the environment.

- **T** Transformation process that describes the transformation of inputs to outputs and here is subscribed by the transformation of plans and strategies into actions to reach our goals in decreasing the emissions into the air.
- **W** World View describes the world thoughts which guides your chosen way of viewing the problem. In our case the world view is on our sides and all shots have been raised so that governments will take serious action regarding air pollution, as the meeting held in Copenhagen where several prime ministers gathered to discuss the impact of air pollution on humans and the environment as a whole.
- **O** are those in power over the system to cause the stated mess and here they are the same as the actors that's should do the work, because ministries are those who have the power over the stated mess and they are the ones that take decisions regarding these issues and also demand is the main cause for air pollution and especially non-strategic demands.
- **E** Environmental constraints: of course since we are talking about air pollution we can realize that the constraints on the environment are high leading to global warming and environmental threats.

This above check list helps us consider the most important actors and parties involved and causes and effects in the mess, and if we are taking care of all these members of the CATWOE checklist that means we are on a good side of our study.

Stage 4: Conceptual Model

See Appendix 6

Stage 5: Compare Conceptual model with rich picture

After comparing the rich picture with the conceptual models we can see that schools, energy supply, ministries, transportation and other parties involved are covered in both rich picture and conceptual models we can find and make sure that our work is totally correct and we are on the right side and we can see the whole situation clear and deeper, as for the suggestions and solutions for our mess are also clear and ready for implementation.

These suggestions if applied needs an estimated time of 2 years to be fully applied, although the costs are high but the economic loses are even higher and estimated to be about $500 Million yearly and more than $700 Million in Syria and more than $3 billions in Egypt and all these steps be applied in the whole Arab countries, where we can save these economical loses and invest them in saving our citizens and environment and reach better air quality.

Stage 6: Debate with stakeholders involved in the situation

See Appendix 9-Questionnaire

After debating with some of the stakeholders and suggesting our solutions and explaining the effects of air pollution on their lives and children health and environmental health. Most of the survey I made reflects the acceptance of our strategies, but all complained about the government and had some doubts if our government and ministries will really take responsibility of all its duties and apply them as stated in the suggestions, and also there were some suggest as why don't we import some researches and scientists as we do export educated people to developed countries or why don't we get back Lebanese brains from foreign countries and create a good situation for them so that they can help our country develop as they helped other countries develop with less effect on our environment.

Stage 8: Implementation of agreed changes

As we saw in the last step that all changes satisfied our stakeholders so probably the next step fall under the implementation of our plans that will lead to better air quality and healthier environments for all Lebanese citizens.

Session 4: Log Frame, Ethical Statement, SWOT analysis
See the Log Frame: Appendix 7

Ethicality Statement

"People in Lebanon, must protect the environment and especially our air quality for the benefit of future generations"

The above statement explains the idea about saving our lives and others lives, its so important to think of others right, people and nations have struggled all over the past years to get their rights and what they believe of.
God created earth and it's resources and then created human and living beings and resources such as Air, Water, Sun, Soil, Land, and other resources and distributed them equally on all people so that they will benefit from its use to live healthy and enjoy what God has gifted us, and due to our culture in Lebanon that is based on religion and ethics, we should all understand that earth and it's resources are for every living being and no man should destroy such precious gift offered by God, instead we should be responsible and take care of our environment so that our children and grand children will enjoy living in the world we lived in, with better air quality and better living standards and teach them realize this precious gift from our beloved God.

SWOT Analysis

SWOT analysis is an analysis that describes internal and external factors covering strength, weaknesses, opportunities and threats.

- Strength: Our strengths falls under the capabilities and several researches and suggestions that have been made internally from people interested in this subject and other world view suggestions that are clearly stated, also we have international standards issued by ISO that included several criteria to implement that will help us reach better air quality.
- Weakness: our weakness lies under the non-strategic plans and bribes and personal interests of many of the people in charge, which is leading to unsustainable development that is killing our resources and leading to air pollution, also the non-respect of the environment and people living in.
- Opportunities are scare and the good thing is that we still have time to implement the plans and suggestions in order to avoid atmosphere corruptions and now all world view is shifting to take care of the environment so we can benefit from foreign financial and scientific support from developed countries that are helping developing countries avoid more air pollution.
- Threats: the threats are many and cover deceases, such as lung cancer, heart attack, stress, death and other serious and environmental deceases and corruption.

Section 5: Relation with sustainable development and economical impact

Sustainable development is a pattern of resource use that aims to meet human needs while preserving the environment, so that these needs can be met not only in present but also for future generations.
Our case about air pollution is relatively linked in a direct way to sustainable development and the impact development has on the environment, because of human needs from transportation, power, energy, technology and all other needs have a cost on the environment and its resources, but all these resources must be preserved for other generation benefits. We are with the idea of development but this idea alone is not enough because its creating a huge gap and disadvantages, so that's why plans must be formed in order to save our resources and reach better air quality standards.

Chapter III. Client Report

Dear …

Air pollution is one of the major threats our world is facing, Lebanon mainly is facing large CO2 emissions because of transportation, deforestation, houses and buildings demands, power and energy supply and development needs. These needs have been destroying our environment and causing damages to humans and living organisms on planet earth. Many deceases such as stress, lung cancer, heart decease, asthma, and cystic fibrosis these deceases are sometimes causing death.

Air pollution also has a huge effect on the environment; global warming, ozone depletion, acid rain and sea level raise are all caused by air pollution. These crises create threats such as volcano eruptions, earthquakes, tsunamis and other disasters that lead to the death of many living being and shorten earth life.

Our study was based on a soft system method SSM, which allows us study the whole situation and to see which parties are involved and what is causing this mess and what effects its creating and then determine some suggestions that might be useful to help us decrease CO2 and NO2 emissions and have better air quality and better environmental standards.

Our suggestions falls under creating some strategic plans that will inform people about the crisis we are facing, educate them about impacts and implementation that must take place, encourage green products and public transportation modes, implement international standards for environmental control and management such as ISO standards, and researches and development that will surely help us recover from our crisis within 2 years period of time.

At the end, we should all understand that God created earth and its resources for humans and living beings to benefit from and have a good health to live and the fact that earth's resources are not owned by anyone we should preserve and take care of them for the benefit of future generations.

Best regards
Marwan Azar

Chapter IV. Reflection

T306 course helps us practice and experience engaging in a systems practices. I have learned about tools, techniques, methods that helped me a lot learn the course in order to identify the appropriate approach to address some situation that I have perceived as a complex one, such as my final project.
I have learned to differentiate between real-world and real-time process and know what to do in case of a complexity.

Learning outcomes

1. Being a system practitioner: I have learned to be aware and ethical, and to use our own initiatives and skills and learn from our own experiences.
2. Engaging with a complexity: I have learned to show understanding of a complexity, prepare a project plan, and get informed and generate ideas about the whole situation in hand.
3. Contextualize our approach: I have learned how to identify suitable settings for our projects and manage interactions, facilities and cooperation needs for my analysis; I have also learned how to adopt tools and methods in my own work and develop new methodologies for intervention.
4. Managing the complexity: T306 tough me how to adopt our approach into action and how to use the procedures and skills involved in our chosen approach, and its related techniques and tools such as the maps and drawing we have learned from T205 and T306 and how to evaluate our project and messes.

All these main points we have learned from T306 helps us turn into professionals and consultants and help our selves and others solve any problem and mess.

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Appendixes